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THE GENERIC NAME *THERMONECTUS* DEJEAN (COLEOPTERA, DYTISCIDAE) *

BY HUGH B. LEECH

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American students have long used the name *Thermonectes* Crotch, 1873 (Trans. Amer. Ent. Soc., 4:402), for a genus of dytiscid beetles, and have accepted Crotch's designation of *Acilius ornaticollis* Aubé, 1838, as the genotype. This treatment overlooks three earlier references which establish a generic name for the same natural group of species.

In his 1833 *Catalogue des Coleopteres de la Collection de M. le Comte Dejean,* Dejean listed a genus *Thermonetus,* ascribing it to Eschscholtz, and including nine specific names with the author of each. Eight of the names were then *nomina nuda,* but for the *Dytiscus circumscriptus* Latreille, 1809, there was both a description and a figure, and the species is thus the type of the genus *Thermonetus* Dejean, 1833.

In his third, or 1837, Catalogue, Dejean emended the name to read *Thermonectus.* The same nine species are listed, and four more added; of these latter, three are *nomina nuda,* the *Hydaticus variegatus* Laporte de Castelnau, 1834, being valid. Since the third edition of the Catalogue is, according to the title page, "Revue, corrigée et augmentée", it seems best to accept the emended spelling. We thus have the genus *Thermonectus* Dejean, 1837, with *Dytiscus circumscriptus* Latreille, 1809, as the designated genotype.

Unfortunately, not all workers accept the genera proposed in Dejean's Catalogues. The Committee on Generic Nomenclature of the Royal Entomological Society of London has agreed to apply to the International Commission on Zoological Nomenclature to have Dejean's Catalogues declared as of no standing in nomenclature. On the other hand, the genera are widely accepted in America (cf. Barber and Bridwell, 1940, Bull. Brooklyn Ent. Soc., 25 (1):1-12). For persons who do not accept those Dejean Catalogue generic names which cover valid specific names, there is *Thermonectus* Melsheimer, 1844 (Proc. Acad Nat. Sci. Philadelphia, 2:26). In this paper Melsheimer describes as new, from Pennsylvania, *T. irroratus* and *nimbatus;* the latter is quite certainly a synonym of *T. basilaris* (Harris), 1829, as has been noted by later writers. Melsheimer himself suggested that his *irroratus* might be *ornaticollis* Aubé, 1838, but Zimmermann (1920, *in* Coleopterorum Catalogus, pars 71, p. 236) has put it under *nigrofasciatus* Aubé, 1838. This placing is surely wrong; by description and by locality, *irroratus* agrees far better with *ornaticollis.*

I hereby designate *Thermonectus irroratus* Melsheimer, 1844, (=*Acilius ornaticollis* Aubé, 1838) as the genotype of *Thermonectus* Melsheimer, 1844. The name *Thermonectes* Crotch, 1873, is thus a synonym of *Thermonectus* Melsheimer, which latter is either a homonym and synonym of *Thermonectus* Dejean, 1837, or a valid generic name, depending on the acceptance of said Catalogues.

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SEPARATION OF THE EUROPEAN SPRUCE SAWFLY IN AMERICA FROM *GILPINIA POLYTOMA* (HTG.) (DIPRIONIDAE, HYMENOPTERA) AND EVIDENCE OF ITS INTRODUCTION‡

BY R. E. BALCH,* W. A. REEKS,* AND S. G. SMITH†

HISTORY OF STUDY

The discovery of the "European spruce sawfly" in Canada in 1930 and the development of its destructive outbreak have been described (3). It was identified in 1931 as *Diprion polytomum* (Htg.), which became *Gilpinia polytoma* (Htg.) in 1939 as a result of Benson's revision of the genera of the Diprionidae. The work of parasite introduction (1) commenced immediately on the assumption that the insect was an importation from Europe. Although such measures cannot be delayed until the origin of a destructive species is definitely established, it is of considerable importance to obtain all available evidence on this point in order that the studies of the insect's behaviour and the results of parasite introduction may be properly interpreted. Before such studies can be made the basis for generalization about forest insect outbreaks and the use of parasites, it must be known whether we are dealing with a native or an introduced species. Unfortunately, definite proof of introduction is often difficult to obtain and is available only in the case of a few species, such as the gipsy moth, *Liparis dispar* (L.). In the majority of cases it is necessary to rely on deduction from limited evidence, as in the case of the larch sawfly, *Pristiphora erichsoni* (Htg.).

As our studies of the spruce sawfly in Canada progressed, it became evident that it showed certain differences from *G. polytoma* in Europe (2). Notably, the material collected in Europe showed almost equal numbers of males and females, while in Canada about one male to 1200 females occurred in the forest. Rearing experiments demonstrated that all Canadian females were thelytokous (obligatory parthenogenesis) while the few studied in Europe were arrhenotokous (facultative parthenogenesis). In addition, it was found that in Canada practically all the cocoons were spun beneath the surface of the ground, while in Central Europe the very great majority were spun above ground in the branches or undergrowth (9). Also, the tendency to diapause was very strong in Canada and might last as long as six years, while in Europe diapause was comparatively rare and short. This threw some doubt on the assumption that the sawfly in Canada was identified with *G. polytoma* in Europe and suggested three possibilities. It was either distinct and native to Canada, it had been introduced from Europe and a new form had developed in this country, or it was an European form which had hitherto been unrecognized.

Meanwhile, morphological studies by Reeks (10) showed that the European adults could generally be separated from the Canadian by slight differences in colour and size and in certain characters of the genitalia of both sexes.

As thelytoky was obviously of great importance in reproductive rate and power of spread, it was thought that a study of the cytology of the Canadian sawfly might throw some light on the mechanism of sex determination and at the same time a comparison with the arrhenotokous European sawfly might help to determine whether it was distinct. This study was commenced by Smith in 1936 and showed that the Canadian form had 7 chromosomes in the male and 14 in the female, while 24 European specimens from Northern Bohemia which were studied showed a basic number of 6, with the same haplo-diploid form of sex determination (14). The work was continued, and a female from Silesia was found with 14 chromosomes, indicating the existence there of a second

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form, possibly identical with the Canadian form. The necessity for further study of European material was indicated, and particularly of reared material, with a view to determining what association existed between the different types of morphology, cytology and reproduction observed.

COMBINED STUDIES OF MORPHOLOGY, CYTOLOGY, AND REPRODUCTION

In 1937 the work was transferred to England. Material was obtained from various regions in Czechoslovakia and the progeny reared from virgin females. It was found that some of the parents were thelytokous. Comparison of the behaviour of the progeny indicated that those from thelytokous parents invariably spun their cocoons in moss, while the arrhenotokous larvae generally chose the twigs. Also, diapause was much more frequent in the thelytokous larvae.

Some of each family were used for cytological study in the larval stage. This showed that the arrhenotokous males had 6 chromosomes and the thelytokous females 14. Others were reared to the adult stage for morphological study to determine whether the two types of genitalia already recognized (12) were associated with the two kinds of reproduction and chromosome number. Smith (15) reared the progeny of 56 European and 3 Canadian females and determined the chromosome number of 103 of the larval progeny. Other progeny of the same parents, totalling 256 males and 35 females, were reared to the adult stage. These, together with their mothers, were submitted to Reeks for a morphological comparison without information as to the relationship among the specimens.

Of 47 parents examined, 25, which were all from Europe and arrhenotokous, fell into type A, while 21, which were all thelytokous, fell into type B. One was incorrectly identified as type B on account of the poor condition of the specimen. A single female appeared from a type A female and it was found to possess the characteristics of type B. Later, it seemed fairly certain that this exceptional case resulted from an accidental admixture from a thelytokous culture, since 8 males from the same family possessed the type A genitalia and 5 others had B chromosomes. See p 241.

Of a total of 241 male adult progeny of arrhenotokous mothers fit for examination, all were found to possess type A genitalia. Of 75 male progeny which were studied cytologically, all showed 6 chromosomes. Thirty-five female offspring of 2 Canadian and 19 European thelytokous mothers were examined and found to agree in type with their parents. Only one male of three produced from type B parents from Europe was reared and this had type B genitalia, identical with that of the rare males found in Canada. A summary of the number of individuals studied is shown in the accompanying table. Some were obtained from family rearings and some from field collections. In certain instances all of the distinguishing characters, morphology of the adult and chromosome number and type of reproduction of the family, are known. In other cases, only one or two of the characters are known. The data for Europe and Canada are recorded separately.

The figures for field collections do not necessarily represent the relative abundance of the two forms, as selection may not have been random. However, it has been found possible to separate them with fair accuracy on the basis of general appearance, chiefly colour differences, and classification of some 400 additional individuals in this way indicates that the arrhenotokous form is the more numerous, especially in Central Europe.

These studies show that the type A genitalia are associated with arrhenotokous reproduction and a basic chromosome number of 6, while the type B genitalia are associated with thelytoky and a basic chromosome number of 7.

Number of Individuals Examined and Relationship of Characters.

Material	Type of Reproduction: Arrhenotokous ♂	Arrhenotokous ♀	Thelytokous ♂	Thelytokous ♀	Chromosome Number: n=6 2n=12 ♂	n=6 2n=12 ♀	n=7 2n=14 ♂	n=7 2n=14 ♀	Genitalia: Type A ♂	Type A ♀	Type B ♂	Type B ♀
EUROPEAN												
Reared:												
Parents	.....	34	.....	.....	.....	.....	.....	.....	.....	25	.....	.....
	.....	.....	.....	22	.....	.....	.....	6***	.....	.....	.....	19
Progeny	738	1*	.....	.....	75	.....	.....	.....	241	.....	.....	.....
	.....	.....	3	142	.....	.....	.....	25	.....	.....	1	33
Field-collected:												
Lot 1	.....	.....	.....	.....	41	36	1	12	.....	.....	.....	.....
Lot 2	.....	.....	.....	.....	.....	.....	.....	.....	458	344	4	220
CANADIAN												
Reared:												
Parents	.....	.....	.....	3	.....	.....	.....	.....	.....	.....	.....	2
Progeny	.....	.....	.....	19	.....	.....	.....	3	.....	.....	.....	2
Field-collected:												
Lot 1	.....	.....	**	**	.....	.....	7	26	.....	.....	.....	.....
Lot 2	.....	.....	**	**	.....	.....	.....	.....	.....	.....	23	100

* Accidental admixture (see text).
** Presumably thelytokous since no arrhenotokous forms known in Canada.
*** Known from examination of sisters.

RELATION OF THELYTOKY TO ARRHENOTOKY

It is evident that these two methods of reproduction have a close phylogenetic relationship, for there are numerous cases of forms differing solely or chiefly in their type of parthenogenesis. Sometimes, as with *Aleurodes vaporarium* Westd. (13), *Lecanium corni* Bch. (16, 6), and *Hemiteles areator* Pang., the two forms appear to have more or less distinct geographical distributions They have been variously designated as races, varieties and subspecies. Vandel (17) reports that the isopod, *Trichoniscus provisorius* Rac., is normally bisexual but there is a thelytokous geographic race in Northern Europe. This form produced occasional males which were triploid and sterile when mated to females of the bisexual form. Marchal (7) found two forms of *Trichogramma* in the same garden. One, which he considered to be *T. evanescens* Westd., was arrhenotokous; the other differed in colour and was thelytokous and he named it as a separate species, *cacaeciae*. There are many cases of closely related species of sawflies differing in reproductive habit. For example, *Pristiphora erichsoni* (Htg.) and *P. pini* Ratz.; *Cimbex connata* Schr. and *C. lutea* L.; *Eriocampa ovata* L. and *E. umbricata* Kl.; *Pristiphora pallipes* Lep. and *P. conjugata* D. The closest relationship appears in *Phylloxera*, where both female-producing and male-producing females may arise from one mother in varying proportions (8).

The presence of a spermatheca in the female and fully developed testes in the male of the sawfly in Canada leaves no doubt that bisexual reproduction preceded obligatory parthenogenesis. It follows that where an arrhenotokous and a thelytokous form exist in separated geographical areas, as in the present case, the thelytokous form is very likely to have originated from the area in which the arrhenotokous form is native. When a female-producing form arises, other things being equal, it would be likely to compete successfully with the male-producing form, and, under conditions unfavorable to mating, tend to replace it. This would be especially true if a limited number of individuals were carried into new areas. The bisexual habit seems unlikely to recur when the males are haploid and the females diploid, since, if fertilization took place, the offspring would be triploid and probably sterile. Experiments in Canada

indicate that while copulation is occasionally attempted it does not result in fertilization. The absence of the arrhenotokous form in Canada is therefore not surprising, although its apparent preponderance in Central Europe implies that other factors favour its survival.

CONCLUSIONS WITH REFERENCE TO ORIGIN OF CANADIAN FORM

Two distinct species occur in Europe which were hitherto included under the name *Diprion polytomum* (Htg.), now *Gilpinia polytoma* (Htg.) One has the thelytokous method of reproduction, with a tendency to frequent and sustained diapause and a habit of spinning its cocoon in the forest floor. The female has 14 chromosomes, the male 7, and they can both be distinguished almost invariably from the other species by characters in the genitalia although no other morphological characters are reliable. The other species has the arrhenotokous type of reproduction, with little or no tendency to diapause and a habit of spinning most of its cocoons above ground. The male has 6, the female 12, chromosomes.

The spruce sawfly in Canada is identical with the European thelytokous species, and was very probably introduced from Europe. This conclusion regarding introduction is based on the brevity of its recorded history on this continent, on its distribution and the spread of the outbreak, on the almost complete failure of native parasites to attack it, and on the fact that a closely related bisexual form from which it is likely to have derived, or which originated from a common progenitor, exists in Europe but not in America. The identification of a specimen taken near Ottawa, Ontario, in 1922 and another from Mt. Washington, New Hampshire, in 1929, indicates that it was rather widely distributed some years before the heavy infestation of two or three thousand square miles was discovered in the interior of the Gaspé peninsula in 1930. Its powers of flight and thelytokous habit, however, permit rapid spread and establishment, and it is by no means unlikely that the present distribution of the insect has taken place following its introduction to a point in Eastern Canada. Pests of apparent European origin are common in the Maritime Provinces, and Brown (4) has produced evidence of a large number of introductions of Coleoptera into this region. Extensive annual surveys since 1930 (3) strongly suggest that the sawfly has spread out in comparatively recent times from the Gaspé, although that may not have been the point of original introduction. It has not yet been found west of longitude 81°, and since our studies indicate it is adapted to conditions throughout the spruce forests which extend across Canada north of the prairies, there seems to be little doubt that it has not yet occupied its entire possible range.

The length of time that the sawfly has been on this continent cannot be estimated. It may be noted that the gipsy moth took twenty years to become noticeably abundant over some 220 square miles, and it has a reproductive potential greater than that of the sawfly, as well as being polyphagous. The sawfly, however, has advantages in method of reproduction and power of dispersal. A very rough estimate based on sample plots suggests that in 1930 it had a population in the Gaspé of probably somewhere in the neighbourhood of 2 cocoons per square foot over some 3,000 square miles, or about 160 billion. If an annual increase of times two be assumed, a single female would have almost this number of descendants (about 137 billion) in thirty-seven years. The development of such an outbreak from a small introduction within a period of less than fifty years is therefore well within the bounds of possibility.

Less than 0.02 per cent of the sawfly population has been parasitized by native parasites (11). It is extremely unlikely that this would be the case with a native species, especially as related species of *Pikonema* and *Neodiprion* on the same trees are often heavily parasitized.

The fact that Benson's genera *Gilpinia* and *Diprion* contain no species of known American origin reduces the probability of the form in Canada being native to America, especially as there is little doubt that such a thelytokous species originated from a closely related bisexual form and such a form is only known to occur in Europe. *D. simile* (Htg.) and *G. frutetorum* (F.) are considered to be recent introductions to America. It is recognized, however, that the distribution of the species of a taxonomic group is not necessarily a clear indication of its continental origin. One species of *Diprion,* namely, *nipponica* Roh., is apparently limited to Asia. Also, although the genus *Neodiprion* Roh. is typically American there is one exception, *N. sertifer* (Geoff.), which is apparently of European origin.

Since only thelytokous reproduction occurs in Canada, this would result in a population of homozygous clones, the number depending on the genetic constitution of the original introduction, subsequent survival, and mutation. Our studies indicate a high degree of uniformity in the morphology of the population. Experiments with a large number of lines reared from individual females for as many as 23 generations have shown that variations in size are attributable to differences in host and feeding conditions. At the same time it has been shown that the tendency to diapause and to male production varies considerably between lines. In the Gaspé, lines with high diapause tendency predominate, and this tendency decreases in the population toward the south. This may be due to the natural selection of high diapause lines in the north where the season is only long enough for one generation, and to a higher rate of reproduction of low diapause lines in the south where two or more generations are possible.

The arrhenotokous species in Europe is apparently somewhat smaller than the thelytokous species, but it is difficult to eliminate environmental influences on size. Our rather limited data do not permit any definite conclusions as to the degree of variability in this species. The fact that Enslin (5) named a number of varieties within the genus *Lophyrus* suggests, however, that the group is variable. In view of the present case, it seems likely that some of these varieties may be of specific order. The occurrence of one male in our field material from Finland with seven chromsomes and another with genitalia distinct from the two types recognized in all other individuals studied suggests that another species closely related to *polytoma* may exist. It is even possible, since seven is the basic chromosome number for the genus (15) and arrhenotoky the typical method of reproduction, that it might be a seven-chromosome arrhenotokous form which was the progenitor of the seven-chromosome thelytokous species and the six-chromosome arrhenotokous species.

Descriptions of the two species and a discussion of nomenclature are given in a separate paper by Reeks (12).

This problem affords an illustration of the importance of sound taxonomy in applied entomology. It also emphasizes the value of other than morphological studies for a full understanding of the nature of specific differences. It is suggested that more frequent collaboration between taxonomists and other biologists would result in mutual benefit.

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THE NYMPH OF *SOMATOCHLORA WALSHII* SCUDDER

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For many years the nymph of *Somatochlora walshii* Scudd. has eluded our pursuit, in spite of the fact that its geographical range, unlike that of most of our Somatochloras, includes practically all of the settled parts of the eastern provinces and it is by no means a rare species in its special habitat—boggy streams and ditches.

At last this nymph has come to light. On June 5, 1940, Mr. T. N. Freeman and the writer entered the Mer Bleue at Carlsbad Springs, Ontario, and we had just crossed the "moat" or ditch which skirts the edge of the bog, when I discovered a newly emerged male of *S. walshii* resting on the low sedges and grasses that were growing in the bog a little beyond the open water. I soon found the exuvia clinging to a sedge a foot or so above the water.

I also have a full-grown female nymph which doubtless belongs to this species taken in the Mer Bleue in the spring of 1929. It was found in a small sphagnum pool close to a rocky island, which rises above the bog nearly opposite the spot where we entered in 1940, and was only about half-grown when first discovered. I kept it alive until the January of the following year when it was due to emerge, but it died before commencing to transform.

We are thus able to present the characters of both sexes of this nymph. It resembles the nymph of *S. minor* Calvert very closely.

Description of nymph. Nearly uniform brown, not very hairy. Head of the usual form for the genus, the hind angles broadly rounded and the occipital margin slightly concave; hairs distributed as follows: a group of 15-20 rather long hairs over the postero-lateral convexities and a few lateral ones below these;

PLATE XIV.

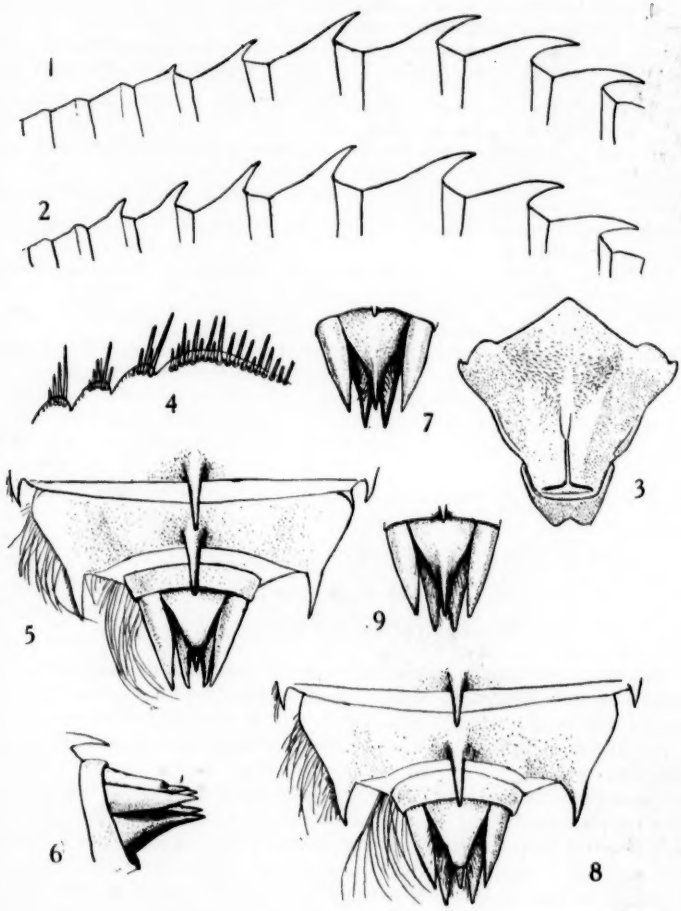

Fig. 1. *Somatochlora walshii* Scudd; dorsal hooks in profile.
2. *S. minor* Calvert; dorsal hooks in profile.
3. *S. walshii;* mentum and part of submentum of labium.
4. *S. walshii;* marginal crenulations of right labial palp at the postero-ventral angle.
5. *S. walshii;* terminal segments and anal pyramid of male.
6. *S. walshii;* anal pyramid of male, profile.
7. *S. walshii;* anal pyramid of female.
8. *S. minor;* terminal segments and anal pyramid of male.
9. *S. minor;* anal pyramid of female.

a thin fringe of somewhat shorter marginal hairs on the frons and a row of very short hairs on the lateral half of the postocular suture; antennal hairs as usual, thickest on the first two segments. Labium (Fig. 3) reaching base of middle coxae; mentum about as broad as long, constricted near the base and somewhat flaring in the distal third; mental setae 10 (9 on one side of ♀), the inner three much shorter than the others; lateral setae 7; crenulations of labial palpi (Fig. 4) as in *minor*, each with a group of setae in a graded series, usually 4 or 5, the longest about as long as one of the crenulations.

Hind wing-cases reaching base of segment 6 (exuvia) or beyond the middle of 7 (nymph, segments somewhat contracted). Hind femora about one-seventh longer than width of head, each with 2 to 4 scattered dorsal hairs and still fewer ventral hairs. Hind tibiae about as long as width of abdomen, with numerous setae whose length is about 1.5 times the width of the tibia.

Abdomen widest between segments 5 and 6; dorsal hairs nearly absent, confined (♀) to a few along the hind margin of 9 and two or three on that of 8; a fairly dense lateral marginal fringe, which is short and inconspicuous except on 8 and 9, where it is increasingly long (Fig. 5). Lateral spines on 8 and 9 as in *minor* but somewhat more slender (Fig. 5, 7), those on 8 about a sixth as long as the segment margin (including spine), those on 9 about one-third as long as the margin of this segment. Dorsal hooks (Fig. 1) present on segments 4 to 9 slightly more slender than in *minor* (Fig. 2), that of 4 a mere vestige, much smaller than in *minor*, that of 5 half as long as its segment, the others much the same in length as in *minor*.

Anal pyramid in ♂ barely longer than segments 9 +10; inf. apps. of ♂ scarcely longer than lat. apps. (cerci); in ♀ (Fig. 6) distinctly longer; med. app. two-thirds (♀) to five-sevenths (♂) as broad as long, somewhat acuminate, especially in ♀ (Fig. 7), its profile in ♂ barely concave (Fig. 6); lat. apps. with sides nearly straight, apices acute.

Total length (mm.), ♂, 20.5; ♀, (contracted) 17.5; width of head 6; width of abdomen 7.25; hind wing-pad 6.5; hind femur 6.4; hind tibia 7.

The nymphs of *Somatochlora walshii, minor* and *elongata* are very much alike. It is doubtful whether the earlier instars, if such were available, could be separated with any degree of certainty. As far as full-grown nymphs are concerned the following observations may be of some value.

1. *S. elongata* may be recognized by its larger dimensions (Walker '25) *.

2. *S. walshii* appears to be distinguishable from *S. minor* in the absence of any trace of a dorsal hook on segment 3, on which a small but quite distinct spine is present in *S. minor* (overlooked by Walker, '25, and hence omitted from Fig. 138). This hook is also absent in the single nymph of *S. elongata* which we now possess, although there is a very slight elevation in its place. The dorsal hook on segment 4 in *walshii* is much smaller than in *minor*.

3. The lateral spines on segments 8 and 9 are somewhat more slender in *walshii* than in the other two species.

4. The mentum of the labium in *walshii* is more constricted at base than in *minor*. It is somewhat constricted in the *elongata* nymph but one specimen is not enough to judge of the value of such a slight character.

5. The number of mental setae in *walshii* is somewhat less than in the other species but this again is too variable a character to be assessable without a considerable series of specimens.

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*Walker, E. M. 1925. The North American Dragonflies of the Genus Somatochlora. Univ. of Toronto Studies, Biol. Series No. 26.

NEW NEARCTIC CRANE-FLIES (TIPULIDAE, DIPTERA). PART XVI.

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The preceding part under this general title was published in 1941 (Can. Ent., 73:85-90). The majority of the novelties discussed herewith were collected by myself in the mountains of Colorado; for other specimens I am indebted to Professor Harry C. Severin, South Dakota State College; Dr. Charles D. Michener, University of California; and Dr. Alan Stone of the United States National Museum. Where not indicated to the contrary the types of the novelties are preserved in my extensive collection of these flies.

Tipula (Bellardina) faustina n. sp.

Allied to *subcinerea;* general coloration of notum gray, the praescutum with four darker gray stripes that are narrowly bordered by brown, the mesal edges of the intermediate pair of stripes short; pleura variegated dark brownish gray and pale; wings pale brown, patterned with darker brown and subhyaline areas; R_4+_5 nearly straight; male hypopygium with the tergal lobes terminating in spinous points; outer dististyle very large, pale, conspicuously bilobed; inner dististyle with the rostral prolongation a long narrow blade; ovipositor with cerci very long and straight.

Male. Length about 22 mm.; wing 20 mm.; antenna about 4.5 mm.

Female. Length about 28 mm.; wing 22 mm.

Frontal prolongation of head elongate, reddish brown on sides, darker above; nasus stout; palpi brown. Antennae relatively short; basal three segments obscure brownish yellow, succeeding segments more uniformly blackened; flagellar segments with poorly developed basal enlargements; longest verticils exceeding the segments in length. Head gray with a capillary dark brown median vitta; vertical tubercle low and inconspicuous.

Pronotum narrowly darkened medially above, obscure yellow on sides. Mesonotal praescutum light grey with four darker grey stripes that are narrowly bordered by brown lines, the mesal edges of the intermediate pair of stripes indicated only on the cephalic half of sclerite; scutum dark gray, the median region only a trifle paler; scutellum dark gray, slightly darker medially; postnotum clear light gray, with a capillary dark brown median line. Pleura dark brownish gray, extensively variegated with paler on the dorsal sternopleurite, ventral pteropleurite, dorsal meron, hypopleura and ventral pleurotergite. Halteres yellow, the knob more or less darkened basally, the apex pale. Legs with the coxae brownish gray; trochanters pale brown to yellowish brown; femora brownish yellow, the tips blackened, the amount subequal on all legs; tibiae yellow, the tips narrowly infuscated; tarsi passing into brownish black. Wings with the ground color pale brown, restrictedly variegated with darker brown and more extensively with subhyaline; the darker spots include a postarcular darkening in cells *R* and *M;* a small spot at origin of *Rs;* stigma; paler brown seams along cord and a conspicuous cloud at near midlength of cell *Cu*, crossing vein *1st A* into the cell; post-stigmal pale stripe restricted; more than the outer fourth of cell R_5 pale; conspicuous pale marginal spots in cells M_1, *2nd* M_2, M_3, M_4, two in *1st A*, one in *2nd A*, none in *Cu;* veins brown. Venation: Vein R_4+_5 nearly straight; *Rs* from one-third to one-half longer than *m-cu;* cell M_1 short-petiolate.

Abdomen with basal tergites dark brown; succeeding segments orange-fulvous, with narrow brown sublateral stripes and more conspicuous buffy lateral borders; no darkened median stripe on either the tergites or sternites; hypopygium chiefly dark brown. Ovipositor with the cerci long and straight; hypovalvae

much shorter, darkened basally, yellow at tips. Male hypopygium with the ninth tergite transverse, narrowed apically, the caudal margin with a broad U-shaped notch, each lateral lobe produced into a slender spinous point directed caudad and slightly mesad; on ventral surface, on either side of median line, with a flattened sclerotized plate. Outer dististyle very large, conspicuously bilobed, entirely pale. Inner dististyle with the basal portion quadrate, the long narrow beak produced at a right angle from the base into a compressed blade, the apex obtuse; sensory areas restricted in number, placed in a group on outer margin of style at base of rostrum; outer margin of style with numerous coarse erect setae. Ninth sternite with an unusually short flattened lobe or open tube. Eighth sternite extensive, its caudal margin broadly convex, unarmed.

Habitat. Colorado (Eastern Rockies).

Holotype. ♂, Green Mountain Falls, Ute Pass, above Manitou, altitude 8,000 feet, June 28, 1934 (C. P. Alexander). *Allotopotype,* ♀.

Tipula (*Bellardina*) *faustina* is most readily told from the numerous allied species in the Rocky and Sierra Madre Mountains by the structure of the male hypopygium, especially the tergite and dististyles. It is most similar to *T.* (*B.*) *gothicana* Alexander and *T.* (*B.*) *subcinerea* Doane yet very distinct. The recent accession of many new species from Eastern Asia and Tropical America makes it appear unwise to try to maintain the subgenus *Sinotipula* Alexander, 1935, as distinct from *Bellardina* Edwards, 1931. The essential characters of the latter group of a short *Rs* and glabrous veins beyond the cord of the wing break down among the novelties above mentioned.

Tipula (Bellardina) ramona n. sp.

Allied to *subcinerea;* size large (wing, male, over 23 mm.); mesonotum gray, the praescutal stripes conspicuously bordered by dark brown; tips of femora narrowly blackened; wings brownish gray, variegated with darker brown and whitish subhyaline areas; abdominal tergites conspicuously orange with three broken black stripes; male hypopygium large, the caudal margin of tergite with a deep U-shaped notch; outer dististyle blackened, provided with long yellow setae; outer lobe of inner distisyle large.

Male. Length about 23-24 mm.; wing 23-25 mm.; antenna about 4.3-4.4 mm.

Frontal prolongation of head relatively long, dark brown, sparsely pruinose; nasus elongate; palpi black. Antennae (male) of moderate length; scape brownish gray, pedicel obscure yellow, flagellum black; flagellar segments with basal enlargements only slightly developed; longest verticils subequal in length to the segments. Head gray, with a dark brown median stripe extending from the summit of the small vertical tubercle to the occiput; remainder of vertex with numerous dark setigerous punctures.

Pronotum brown, variegated with darker. Mesonotal praescutum light gray with four slightly darker gray stripes that are chiefly delimited by conspicuous dark brown borders, the lateral margins of the intermediate pair and the mesal margins of the lateral stripes broader and narrowly confluent in front; median dark vitta very narrow, capillary; praescutum behind the pseudosutural foveae more or less distinctly darkened; posterior sclerites of notum gray, patterned with brown, including the centers of the scutal lobes and a nearly continuous capillary vitta extending from the suture to the abdomen. Pleura light gray, variegated with darker gray and more yellowish areas. Halteres with stem yellow, knob dark brown. Legs with the coxae gray; trochanters yellow; femora obscure brownish yellow, the tips narrowly blackened, the amount subequal on all legs; tibiae and basitarsi brownish yellow, the tips very narrowly infuscated; remainder of tarsi dark brown. Wings with the ground color brownish gray,

variegated with darker brown and whitish subhyaline markings; the darker brown includes areas at origin of *Rs;* stigma, and a confluent seam on anterior cord; two areas in outer half of cell *M* adjoining vein *Cu;* two similar but smaller areas in basal half of cell *Cu;* two darkenings in cell *1st A* adjoining vein *2nd A;* wing-tip paler, with restricted marginal pale areas in cells R_5 to M_4 inclusive, in the medial cells isolated and not reaching the actual margin of wing; extensive pale brown areas in cells *R,* outer half of *M,* and *1st A,* these vaguely bordered by darker brown; cell *2nd A* almost uniformly pale brown; veins brown. Venation: *Rs* about two and one-half times *m-cu;* cell R_3 slightly constricted beyond base; basal section of R_4+_5 subequal to *r-m.*

Abdominal tergites with the median portion conspicuously orange, with broken median and sublateral black stripes; first tergite and lateral margins of tergites two and three light gray; succeeding tergites with lateral borders more narrowly buffy; sternites varying from obscure yellow to gray, the basal segments with a relatively indistinct median brown stripe, the outer segments more uniformly dark brownish gray; hypopygium dark brown, the outer portions paler, Male hypopygium large and conspicuous; sutures between tergite, sternite and basitstyle all deep and complete. Ninth tergite large, the posterior border with a deep U-shaped notch, the lateral lobes oblique with their margins thickened and with a slight lower flange; base of notch with a further tiny U-shaped emargination. Outer dististyle blackened, provided with long yellow setae. Inner distisyle complex, with a very large outer lobe that bears the usual area of sensory pits, this lobe more than twice as extensive as the outer dististyle; main body of style very long and narrow, extended into a narrow beak and backward into an obtuse compressed blade. Ninth sternite with a restricted brush of long setae at outer end of lobes, with a dense brush of more delicate setae at base of notch. Eighth sternite unarmed.

Habitat. Colorado (Eastern Rockies).

Holotype. ♂, North Cheyenne Canyon, Colorado Springs, altitude about 7,000 feet, June 27, 1934 (C. P. Alexander). *Paratopotype,* 1 ♂.

The nearest relatives of the present fly are *Tipula* (*Bellardina*) *commiscibilis* Doane and *T.* (*B.*) *subcinerea* Doane, both of which are readily told by the very different male hypopygia. The type locality is not distant from the original grave of Helen Hunt Jackson (1831- 1885) on Inspiration Point, where the novel "Ramona" was written.

Tipula (Bellardina) pura n. sp.

Allied to *rupicola;* size relatively small (wing, male, 19 mm.); general coloration dark gray with four still darker gray stripes that are bordered by dark brown; femora with obscure yellow subterminal rings; wings pale brown, conspicuously patterned with darker brown and whitish subhayline; vein R_4+_5 strongly arched immediately beyond midlength, narrowing cell R_3; male hypopygium with the outer dististyle pale, of very irregular conformation, at apex divided into two parts, the upper of which is a blackened spine; notch of ninth sternite with a long conspicuous median tube.

Male. Length about 17 mm.; wing 19 mm.; antenna about 3.5 mm.

Female. Length about 23 mm.; wing 23 mm.

Frontal prolongation of head brown; nasus conspicuous; palpi black. Antennae with scape obscure brownish yellow, pedicel clear yellow, flagellum dark; flagellar segments with scarcely developed basal swellings; longest verticils subequal to the segments. Head reddish brown, gray pruinose, with a capillary dark brown vitta back from the low vertical tubercle.

Pronotum brownish gray. Mesonotal praescutum with the ground color dark gray, with four deep reddish brown stripes that are presumably heavily

gray pruinose in fresh specimens; in female all stripes are clear gray, narrowly and completely bordered by dark brown, the two inner margins very close together though separated for most of their lengths; setigerous punctures faintly darkened; scutum with median area light gray, each lobe with two dark gray areas that are narrowly bordered by brown; scutellum and mediotergite light gray, with a continuous broader median vitta. Pleura variegated light and dark brownish gray over a reddish brown ground; dorsopleural membrane yellow. Halteres dusky, the base of stem narrowly pale, the apex of knob restrictedly brightened. Legs with the coxae gray; trochanters yellow; femora brownish yellow, the tips rather narrowly blackened, preceded by a slightly narrower obscure yellow ring; tibiae yellowish brown, the tips darker; tarsi passing into dark brown; claws simple. Wings with the ground color pale brown, conspicuously patterned with darker brown and whitish subhyaline areas; the darker markings include a postarcular area; a small spot at origin of *Rs;* the oval stigma; a continuous seam at outer end of cell *1st* M_2 and the petiole of cell M_1; a cloud at the narrowed part of cell R_3; small brown marginal spots at ends of veins R_4+_5 to *2nd A,* inclusive, with a whitish marginal area between each pair of spots; three dark markings in basal two-thirds of cell *Cu,* the outermost crossing vein *Cu* into cell *M;* the whitish areas include a nearly complete band before cord, extending from vein *R* to the posterior margin; an incomplete band beyond stigma, involving almost all of cell R_5; outer medial cells almost entirely whitened, especially in female; basal third of cell *2nd A* white; veins brown. Venation: *Rs* short, subequal to *m-cu;* distal section of R_4+_5 strongly arched immediately beyond midlength, narrowing cell R_3 at this point; petiole of cell M_1 subequal to or shorter than *m*.

Abdominal tergites yellowish orange, the first segment pruinose; a scarcely indicated darker median stripe and very conspicuous, entire, brownish black, sublateral stripes; lateral margins buffy gray; sternites obscure orange, the outer segments with blackened lateral borders; hypopygium dark brown, the outer dististyles obscure yellow. Ovipositor with cerci elongate, slender, upcurved at near three-fourth the length; hypovalvae short, the truncated tips blackened. Male hypopygium with the suture between tergite and sternite distinct; basistyle reduced in size, the sutures scarcely indicated. Ninth tergite pale, the caudal margin with a low rounded lobe on either side of the median line. Outer dististyle pale, of very irregular conformation, appearing as a short-stemmed rod, at apex split into a flattened-compressed blade and a more dorsal acute blackened spine; at base of style with a subcircular flattened flange. Inner dististyle appearing as a narrow clavate blade that is slightly less extensive than the outer dististyle. Notch of ninth sternite with a long conspicuous open median tube that is produced by the upcurved margins of paired appendages as in *rupicola* and *albimacula.*

Habitat. Colorado (Eastern Rockies).

Holotype. ♂, Salida, altitude 7,500 feet, June 30, 1934 (C. P. Alexander). *Allotype.* ♀, Green Mountain Falls, Ute Pass, above Manitou, altitude 8,000 feet, June 26, 1934 (C. P. Alexander).

The curious elongate tube of the ninth sternite of the male hypopygium allies this fly with *Tipula* (*Bellardina*) *albimacula* Doane and *T.* (*B.*) *rupicola* Doane, both of Arizona, despite the other very different structural details of the male hypopygium.

Pedicia (Pedicia) falcifera n. sp.

Wings strongly falcate in outline; dark seam along vein Cu_1 not reaching wing margin; cell *1st* M_2 longer than in *albivitta,* the second section of vein M_1+_2 the longest element; cell M_4 deep, nearly twice as long as *m-cu;* dark areas

of abdominal tergites and sternites broadly interrupted at incisures by fulvous orange.

Sex? Length of wing 21 mm.

Rostrum dark gray; palpi black, elongate as in the subgenus. Antennae black, the scape pruinose, the outer flagellar segments passing into brownish yellow; outer flagellar segments relatively long, with very long verticils. Head dark gray.

Cervical region dark brown. Pronotum light orange or fulvous, darkened along cephalic margin and lateral borders. Mesonotal praescutum clear light gray with four narrow grayish brown stripes, the intermediate pair darker brown in front, separated by a capillary line of the ground color; lateral stripes clearer gray, narrowed at anterior ends, crossing the suture onto the cephalic portion of the scutal lobes, each lobe with a much larger dark gray central area; scutellum light gray, the parascutella obscure brownish yellow, narrowly dark brown adjoining the scutellum; mediotergite gray, the cephalic lateral portion restrictedly darkened. Pleura light ashy gray, the dorsopleural region reddish brown, with a large brownish black area at and immediately behind the spiracle; pleurotergite with a more or less distinct dark area extending from the wing-root ventrad to beneath the base of halteres. Halteres relatively long, pale yellow. Legs with the coxae light gray; trochanters obscure yellow; femora obscure yellow, the tips narrowly brownish black, the amount subequal on all legs and involving the distal seventh or eighth of the segment; tibiae whitish, the tips darkened; remainder of tarsi obscure yellow, the outer segments infuscated. Wings subhyaline, with the usual dark pattern of the subgenus; cell *Sc* chiefly pale; pale area in outer end of cell R_1 before the stigma extensive; basal darkening in cell *Cu* short; dark seam along vein Cu_1 not quite reaching the wing margin, interrupted at beyond four-fifths the length; veins pale, brownish yellow in the patterned areas. Wing-outline strongly falcate, relatively narrow, the margin of the medial field strongly incurved to make the outer radial field unusually projecting. Venation: Cell *1st* M_2 much longer than in *albivitta*, the second section of M_1+_2 the longest element; cell M_4 deep, nearly twice as long as *m-cu*.

Abdominal tergites light gray with conspicuous long-rectangular darker gray areas that are narrowly bordered by black, more extensively so behind; incisures, including the narrow posterior portions of the segments and the more extensive basal rings fulvous orange; on basal sternites the median areas are similar but slightly longer and narrowed posteriorly; abdomen broken beyond the fourth segment.

Habitat. South Dakota (Black Hills).

Holotype. Sex? Custer, July 22, 1924 (H); South Dakota State College Collection, through Professor Severin.

Pedicia (Pedicia) falcifera is most similar to *P. (P.) albivitta* Walker, of northeastern North America, differing especially in the details of wing-pattern, the even more strongly falcate wings, and in the venation, especially the longer cells *1st* M_2 and M_4. The only other species of *Pedicia* with such strongly falcate wings is *P. (P.) falcata* Alexander, of the highest montains of southeastern China (Fukien).

Pedicia (Tricyphona) ampla truncata n. subsp.

Male. Length about 15 mm.; wing 14 mm.

Female. Length about 25 mm.; wing 18 mm.

Close to the typical form, *ampla* Doane, of British Columbia and the northwestern United States, differing especially in slight details of the male hypopygium. Median lobe of the ninth tergite long, very gradually narrowed outwardly, the apex truncate or virtually so, there being only a slight suggestion

of emargination on the extreme median portion. Female fully-winged. The pubescence of the eyes is virtually lacking whereas in the typical form this is unusually long and dense.

Habitat. California (South).

Holotype. ♂, Tahquitz Valley, San Jacinto Mts., June 3, 1940 (C. D. Michener). *Allotopotype.* ♀, in copula with type.

Chionea albertensis n. sp.

Belongs to the *araneoides* group; antennae 11-segmented, the fusion-segment short-transverse, with eight simple segments beyond it; first flagellar segment beyond the fusion short and broad; general body coloration reddish brown, the pronotum and praescutum obscure yellow medially; halteres pale yellow; legs yellow, the tarsi more darkened; male hypopygium with the posterior border of tergite produced into small setiferous lobes on either side of a shallow median emargination; dististyle relatively stout, cultriform, at its base with a roughly oval, heavily blackened lobe or appendage; gonapophyses appearing as flattened yellow plates, their tips narrowly obtuse; aedeagus very long and slender, sinuous, at apex split into two slender pale blades.

Male. Length about 5.5 mm.; diameter across notum between halteres 1 mm.

Rostrum reddish brown; palpi darker brown. Antennae 11-segmented, there being eight segments beyond the short, transverse fusion-segment; scape brownish yellow, pedicel and fusion-segment darker brown, remainder of flagellum pale brown; first segment beyond the fusion short and broad, its transverse diameter greater than its length; second segment about two-thirds the length of the third; succeeding segments more elongate, the terminal one about two-thirds the length of the penultimate; verticils very long, exceeding the segments in length, placed at near midlength of the segment which is more or less incised at the point of insertion of the bristles. Head reddish brown, sparsely pruinose, especially in front.

Pronotum and praescutum obscure yellow medially, more reddish brown on either side of the median line, on the praescutum the lateral edges of the yellow stripe demarked by numerous long black setae; remainder of mesonotum light reddish brown; rudiments of wings distinctly present though minute, directed cephalad. Pleura uniformly reddish brown. Halteres pale yellow. Legs with the coxae reddish yellow; trochanters yellow; remainder of legs yellow, the tarsi more darkened; femora moderately incrassated.

Abdominal tergites reddish brown, the sternites and hypopygium clearer yellow; abdomen short and stout, the hypopygium massive. Male hypopygium with the ninth tergite having a small rounded lobe on either side of a shallow median emargination, each lobe provided with several long strong setae. Basistyle stout. Dististyle a relatively stout cultriform blade, the tip subacute; face of style at base with a roughly oval, heavily blackened lobe or appendage, with a few scattered setae immediately distad. Gonapophyses appearing as flattened yellow plates, the tips narrowly obtuse, the surface slightly wrinkled. Aedeagus unusually long and slender, sinuous, the apex split into two long, very slender, pale blades that are narrowed to acute hyaline points.

Habitat. Alberta.

Holotype. ♂, Banff, without further data; United States National Museum, through Dr. A. Stone.

Most similar to the northeastern Nearctic *Chionea primitiva* Alexander, which differs in the 12-segmented antennae that have the fusion-segment and the segment immediately beyond this elongate and entirely different in shape from the present fly. This latter species differs further from the insect here described

in the structure of the male hypopygium, especially in the tergite which is produced medially into a broad, low, setiferous lobe; the more slender dististyle with a conspicuous tooth on the mesal face at base but without the blackened lobe on face; the shorter aedeagus and the differently constructed gonapophyses. Kratochvil (Bull. Soc. Ent. France, 1936, 250) divided the western Palaearctic species of *Chionea* into two groups, the *Chioneae longicornae*, having nine or ten antennal segments and including the genotype, *C. araneoides* Dalman, and one further species; the second group, the *Chioneae brachycornae* (*brachycerae* Alexander) includes the remaining European species and has only six or seven antennal segments. In the Tipulidae it seems preferable to adhere to the policy of naming groups after the oldest and best-known species and consequently I am using the name *araneoides* group for the *Ch. longicornae* Kratochvil and the *valga* group for the *Ch. brachycornae* Kratochvil. The *araneoides* group in the Nearctic fauna includes only the two species, *C. primitiva* Alexander and the present fly.

Ormosia (Ormosia) viduata n. sp.

Belongs to the *nigripila* group; general coloration of mesonotum almost uniform dark brown, the humeral region of praescutum a little reddened; pleura black; femora black, the bases narrowly brightened; tibiae and tarsi abruptly pale brown or yellowish brown; wings with a brownish tinge, very strongly so in the outer radial cells; male hypopygium with the gonapophyses bispinous at apex, the inner spine about twice as long as the outer.

Male. Length about 5 mm.; wing 5 mm.

Rostrum and palpi black. Antennae with basal segments yellow, the flagellum pale brown, the outer segments somewhat darker; antennae relatively long, if bent backward extending about to base of abdomen; basal flagellar segments oval, the outer segments becoming more elongate, the terminal segment longest; verticils elongate, unilaterally distributed; segments clothed with an abundant dense white pubescence. Head brownish gray; eyes relatively large.

Pronotum brown, the pretergites very pale yellow, the median portion dark brown. Mesonotum almost uniformly dark brown, the surface very sparsely pruinose, the humeral region of praescutum a little more reddened; scutellum slightly more castaneous than remainder of notum. Pleura black, the dorsopleural membrane dusky. Halteres pale yellow throughout. Legs with the coxae infuscated, the apices of the middle pair more brightened; trochanters yellow; femora black, the bases narrowly brightened, including about the basal sixth or seventh; tibiae and tarsi abruptly pale brown or yellowish brown, the terminal tarsal segments more blackened. Wings with a brownish tinge, weak in the basal cells, much more evident in the outer radial field, paling behind in the outer medial field; stigma darkened, merging gradually with the adjoining membrane; veins brown, paling to yellow at wing-base. Numerous macrotrichia in cells of wing, becoming more sparse in proximal ends of basal cells. Venation: Sc_1 ending opposite R_2, Sc_2 only a short distance beyond origin of *Rs* so Sc_1 is very long, exceeding *Rs*; R_{2+3} subequal in length to R_2; *cell 1st* M_2 small, closed; *m-cu* close to fork of *M*; anal veins divergent, cell *2nd A* very wide at near midlength.

Abdomen, including hypopygium, black. Male hypopygium of the usual type of the *nigripila* group. Outer blade of outer dististyle elongate, the spinous points concentrated on proximal two-thirds. Inner dististyle with four or five elongate setae near distal end. Gonapophyses flattened, bispinous at apex, the inner spine about twice as long as but more slender than the outer spine.

Habitat. Colorado (Southern Border).

Holotype. ♂, Cumbres Pass, altitude 9,500 feet, July 28, 1934 (C. P. Alexander).

The nearest ally of the present fly appears to be *Ormosia* (*Ormosia*) *pygmaea* (Alexander) of eastern North America. This has the male hypopygium generally similar but differs conspicuously in the coloration of the body, legs and wings. The general body coloration of the present fly is the darkest of any of the species of the group in North America.

ON THE GENUS *PETALODES*, WITH DESCRIPTIONS OF TWO NEW NORTH AMERICAN SPECIES (HYMENOPTERA, BRACONIDAE) *

BY G. STUART WALLEY,

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The discovery of an interesting species of *Petalodes* in a lot of Braconidae taken in British Columbia prompted the writer to submit a specimen to Dr. C. F. W. Muesebeck of the United States National Museum, for his opinion on the species, which from the literature seemed to be quite close to the genotype, *Petalodes unicolor* Wesm., of Europe. While no specimens of *unicolor* are available for study Dr. Muesebeck very kindly provided me with his rather extensive notes, made several years ago, on Wesmael's type specimen in the Brussels Museum, and also with his notes on a specimen from the Marshall Collection, now in the Szepligeti Collection at Budapest. A study of these notes has convinced me that the Canadian specimens, while very similar to *unicolor*, are specifically distinct, and accordingly I am describing them below. I am also able to include, at this time, the description of a further species of *Petalodes*, from California, based on material sent to me by Dr. Muesebeck. These two species apparently constitute the first valid record of the genus *Petalodes* for North America, the species previously described by Ashmead as *Petalodes politus* being, according to Dr. Muesebeck, not a true *Petalodes*, but rather a member of the genus *Eumacrocentrus*.

It is questionable whether *Petalodes* Wesm. is worthy of being maintained as a genus distinct from *Rogas* Nees. The strongly compressed abdomen of the female, and the fine or obsolescent suture between the second and third abdominal tergites, also the shape of the abdomen, the sides of which are parallel near the base, are the principal characters mentioned by authors to distinguish *Petalodes* from *Rogas*. The Canadian species before me agrees with *unicolor* in these respects, except that the first abdominal tergite is slightly narrowed in the direction of the base, otherwise in general form and color it appears to be very similar. The Californian species differs in having the abdomen of the female less completely compressed than in other two species, and also the suture between the second and third abdominal tergites distinctly impressed and somewhat crenulate, and the body color is very different, resembling certain red and black species of the genus *Rogas*. In fact I have been unable to discover any satisfactory method by which to distinguish the males from that genus. Until the genus *Rogas* has been more thoroughly studied, and its various components evaluated, it may be useful to retain *Petalodes* for the group of species here discussed, which agree in having the abdomen of the female more or less strongly compressed.

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Petalodes palmatus n. sp.

Resembles very closely the European *P. unicolor* Wesm. but differs from that species in the shorter malar space, which is not quite equal to the basal width of a mandible, and the slightly shorter ocellocular line, which is approximately three-fourths as long as the diameter of an ocellus. In the type of *unicolor* the malar space is much longer than the basal width of a mandible and a little wider than the width of the temple to the occipital carina. The ocellocular line in *unicolor* (according to data on the specimen in the Szepligeti Collection) is equal to the diameter of an ocellus. According to Wesmael and subsequent authors the stigma of *unicolor* is yellow, and the body color is described as testaceous, with a fuscous patch at the middle of the base of the propodeum. In *palmatus* the stigma is more or less yellow at the base and at the extreme apex, with the remainder brownish, and the entire propodeum is blackish, as is also the first tergite except on its apical third, and the sheath is black at the apex.

Female. Length 6.5 mm. Head transverse, margined by a distinct carina except medially, in the latter region the carina is very weak; malar space almost equal to basal width of a mandible and slightly narrower than width of temple to occipital carina; temple moderately rounded and receding at an angle of about 45 degrees; antenna 35-segmented, slightly shorter than abdomen, all segments distinctly longer than thick; head finely granular, opaque; face with a few fine, transverse wrinkles below antennae.

Thorax subopaque, granular above, mesopleura and metapleura finely coriaceous, the mesopleura with a few fine, irregular rugulae below the shining subalar prominence; notaulices distinct as far back as tegulae; propodeum opaque, granular, with a few fine, irregular rugulae in the apical portion and a fine, median, longitudinal carina.

Abdomen distinctly longer than combined head and thorax, narrow, compressed, the compression beginning in about the spiracular region of second tergite, the second tergite only moderately compressed, the third more strongly so and the remainder of the abdomen very strongly compressed; first three tergites with lateral margins carinate, the third less sharply carinate and scarcely at all so in its apical one-fourth; first tergite about one-third broader at apex than at base, with sides evenly diverging, at apex almost three-fifths as broad as long; second tergite as long as first, and about one-fourth longer than third, and separated from the latter by an imperfect suture; first tergite quite strongly convex, with a pair of oblique carinae coming together a short distance from the base, and continued beyond to about middle of tergite as a faint median carina; first tergite dullish, granular, rather closely, finely, longitudinally carinulate; second tergite and basal two-thirds of third tergite with very similar sculpture; apex of third tergite and the remaining tergites smooth, with the base of the fourth more or less finely granularly sculptured; sheath about as long as hind basitarsus.

Hind femur not quite three and one-half times as long as greatest diameter; hind tibia as long as trochanters and femur combined, and equal in length to the tarsus.

First discoidal cell a little longer than greatest width; nervulus postfurcal by a little more than its own length; subdiscoideus arising far below middle of brachial cell.

General color testaceous; stemmaticum black; metapleura, metanotum, propodeum, basal two-thirds of first abdominal segment and a more or less distinct streak on upper mesopleura blackish; stigma brownish with a large basal spot and the extreme apex yellowish.

Holotype—♀, Canim Lake, B. C., June 23, 1938 (G. S. Walley). No. 5252, in Canadian National Collection, Ottawa, Ont.

Paratype—♀, Canim Lake, B. C., June 22, 1938 (J. K. Jacob). In collection of United States National Muesum.

Petalodes ufei n. sp.

Very distinct from *palmatus* n. sp. and *unicolor* Wesm. in its entirely black head and thorax, red legs, and red and black abdomen.

Female. Length 8.5 mm. Head transverse; occipital carina distinct, complete; malar space one-third greater than basal width of mandible and equal to width of temple to occipital carina; temple moderately rounded and receding at an angle of about 30 degrees; antenna 51-segmented, a little longer than abdomen, segments of apical half of flagellum short, a few segments not longer than thick; head shining, face rather densely punctured and with a few rugulae near inner orbits, temples and vertex with sparser punctures.

Thorax shining; pronotum finely, irregularly rugulose; mesoscutum, scutellum, mesopleura and metapleura with fine, scattered punctures; notaulices distinct, finely foveolate, meeting in front of scutellum; propodeum with numerous, fine, reticulating rugulae, and with a well defined, median, longitudinal carina on the anterior two-thirds.

Abdomen distinctly longer than combined head and thorax, compression beginning with the third tergite which is only moderately compressed, the segments beyond more strongly compressed but less strongly than in *palmatus;* lateral margins of first three tergites carinate; first tergite very nearly parallel sided, only slightly longer than broad at apex; second tergite slightly shorter than first, and about one-third longer than third, and separated from the latter by a fine, crenulate impression; oblique carinae uniting near base of first tergite to form a median, longitudinal carina; second tergite with a similar carina; both tergites and a narrow basal portion of third with numerous, fine, longitudinal carinulae, the remainder of abdomen polished.

Legs proportioned much as in *palmatus.*

First discoidal cell about twice as long as greatest width.

Head, thorax, propodeum and abdomen beyond second tergite black; mandibles and somewhat the antennae dark rufo-piceous; tegulae piceous; stigma and veins dark brownish-black, with the veins in apical half of wing paler, membrane light brownish; two basal segments of abdomen and legs rufous with apices of hind tibia and the hind tarsus slightly dusky.

Male. Very similar to female in structure and color. Differs in having the antennae about as long as combined thorax and abdomen, with all segments of flagellum distinctly longer than thick; third abdominal tergite reddish on basal half, and the hind tarsus and apex of tibia blackish.

Holotype—♀, Mt. Lassen, Lake Almanor, California, May 20, 1935 (G. P. Engelhardt).

Allotype—♂, May 5, other data as in holotype.

Paratypes—♂, same data as allotype; ♂, Keremeos, B. C., June 17, 1923 (C. B. Garrett).

Holotype and allotype No. 55830 in collection of United States National Museum; paratypes, No. 5253, in Canadian National Collection, Ottawa, Ont.

The male from Keremeos, B. C., differs from the other two males in being slightly larger (length 9.5 mm) and has the apex of the second tergite narrowly stained with fuscous, with the black of the third tergite occupying all but the extreme base.

Host. The specimens from Mt. Lassen are labelled as having been reared from *Ufeus plicatus* Grt.

NOTES

NEW RECORDS OF ACRIDIDAE FROM ALBERTA

While making the adult grasshopper surveys, the authors recorded the various species of Acrididae observed and in this way obtained ten new records for Alberta. The material, where not identified by A. B. Gurney or Morgan Hebard, was determined by comparison with specimens determined by Morgan Hebard.

Mermiria maculipennis macclungi Rehn, Onefour, July 16, 1940 (White and Rock).

Eritettix simplex tricarinatus (Thos.), Onefour, July 15, 1940 (White and Rock). Det. A. B. Gurney.

Hypochlora alba (Dodge), Comrey, July 17, 1939 (White).

Melanoplus oregonensis oregonensis (Thos.), Carway, June 30, 1939 (White).

M. borealis borealis (Fieber), Jasper National Park, July 29, 1939, and August 17, 1940 (Rock); Cold Lake, August 15, 1937 (White and Rock); Cypress Hills, July 15, 1936 (White). Det. M. Hebard.

M. borealis junius Dodge, Valleyview (Peace River district), July 15, 1938 (Rock).

M. foedus foedus Scudder, Orion, July 14, 1939 (White).

M. foedus fluviatilis Bruner, Lethbridge, August 10, 1933 (White). Det. A. B. Gurney.

M. angustipennis (Dodge), Orion, July 13, 1933 (Manson and White), July 14, 1939 (White and Neilson), July 16, 1940 (Rock); Czar, August 18, 1938, Hughendon, August 23, 1939 (Rock). Det. M. Hebard.

Cordillacris crenulata (Bruner), Lost River, Sec. 2, Tp. 1, R. 4, W. 4th (White).

R. M. White and P. J. G. Rock, Dominion Entomological Laboratory, Lethbridge, Alberta.

THE BEAN WEEVIL, *ACANTHOSCELIDES OBTECTUS* (SAY) IN STORED WHITE BEANS

An interesting example of how insect pests in stored food products may increase to enormous proportions was observed during January, 1941, in the Dominion Entomological Laboratory at Kamloops. Twelve months previously, a sample of just over one pint of white beans, infested lightly with the bean weevil, *Acanthoscelides obtectus* (Say), was received at the office. The infestation was allowed to continue at room temperature, in a sealed container, for a year. When checked at this time, the results were as follows:

Total number of beans in container, 1,841; number of infested beans, 1,776; beans not infested, 65. Weight of weevils that had emerged, 24 gm.; number of weevils that had emerged, 14,557 (calculated by counting 1 gm. of weevils as a sample); number of weevils remaining in the beans (average, 3 per bean) 5,328; total population, 19,885 weevils.

During the period of just over one year, it was possible for 19,885 weevils to develop from 1,776 infested beans. This represents an average of 11.2 weevils for each bean. Close examination of the beans showed that this was practically the maximum possible infestation. Almost all available food had been utilized by developing grubs. The beans were merely shells filled with faeces, dead larvae, and empty egg cases.

I. J. Ward, Kamloops, B. C.

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